

# Seeing things clearly: social structure, personality, and accuracy in social network perception

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## *Abstract*

People differ in their ability to perceive accurately the informal patterns of interpersonal relationships in their social groups, i.e., the group's network structure. Existing research leaves us largely unable to explain the variation in accuracy in social network perception. This paper argues that the study of accuracy in social network perception should consider the effect of both situational factors and individual differences. To explore this claim, three research centers in an Italian university were studied. Perceptions of the friendship and the work-related advice networks in the organization were compared to the actual network. The results indicate that both an observer's position in the formal and informal social structure of the organization, and his or her personality traits contribute to determining accuracy in social network perception. © 1998 Elsevier Science B.V. All rights reserved.

## **1. Introduction**

People differ in their awareness of the social connections among those who inhabit their lives. Some individuals have an uncanny knack for knowing who's friends with whom, who works with whom, or who sleeps with whom in their work-setting, neighborhood, or circle of friends. Others are less adept at tracking the friendship, work, and love relationships in their social groups, i.e., the group's informal network structure. What makes some people more accurate than others in perceiving the structure of their social networks? This study makes a first step in answering this question.

Social scientists have long been interested in the accuracy of people's interpersonal judgments. Most of the early psychological research in interpersonal accuracy was in the area of individual differences. This work came to a virtual halt after the publication of the critiques of Cronbach (1955) and Gage and Cronbach (1955), who showed that accuracy judgments of this sort were actually an imprecise aggregation of four unidenti-

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fied components, yielding scores with unclear meaning and studies with ambiguous findings. With few exceptions (e.g., Freeman and Romney, 1987; Freeman et al., 1987) researchers' interest has come to essentially ignore individual differences ("Who is accurate?"), and center instead on the situational factors that affect interpersonal accuracy across individuals, and on the ways in which people systematically stray from accurate judgments ("When and how are people accurate?") (e.g., Tversky and Kahneman, 1974; Killworth and Bernard, 1976; Freeman, 1979; Bernard et al., 1980; Nisbett and Ross, 1980; Bernard et al., 1982; Kenny, 1994).

The purpose of this study was to bring the individual back in the study of interpersonal perception, and identify the determinants of variability in people's accuracy in perceiving the network structure of their social groups. Reviving the tradition in social psychology which considers both individual differences and situational factors in the study of human cognition and behavior (Lewin, 1951), both characteristics of the social context and individual personality traits were investigated as potential determinants of individual accuracy in social network perception.

In spite of the argument that individual differences in accuracy are too limited to make the study of variability interesting (Kenny, 1994: 126-127), understanding why people's accuracy in network perception differs is interesting at the individual level of analysis, and potentially **consequential also at the group and at the organizational levels**. At the individual level, Krackhardt (1990) has shown **that an individual's ability to** perceive accurately the structure of his or her work-related advice network in an organization is an important source of power. Individuals who perceive accurately the structure of advice relationships in their work environment are more capable of getting what they want, since they know which social ties allow them to access the resources they need. The positive relation between accuracy in social network perception and the ability to obtain resources is also consequential at the group and organizational levels. At the group level, the research of Ancona (1990) and Ancona and Caldwell (1992) on the external effectiveness of work-teams in an organization has shown the importance of the role of scouts and ambassadors, i.e., members who monitor and mold the external environment in order to obtain the resources the group needs for its survival. Ancona's research does not directly investigate the relation between accuracy in social network perception and the performance of a group in an organizational context. However, these results hint that the performance of these externally-oriented group members might be enhanced by an accurate perception of the social connections among the people that inhabit the social environment where the group resources come from. In general, at the group, organizational and interorganizational levels, boundary-spanning roles are likely to be better played by people that perceive accurately the social paths through which resources can be obtained (Burt, 1992).

The results of current research leave us largely unable to explain the variability in people's accuracy in perceiving the informal social networks that develop in their social groups. As noted by Ickes (1993), the social psychological literature on the accuracy of interpersonal judgments has mostly focused on an individual's ability to perceive other people's personality traits (e.g., Cronbach, 1955; Taft, 1955; Funder and Sneed, 1993; Funder, 1995), their attitudes, and self-conception (e.g., Knudson et al., 1980), their emotional states (e.g., Eckman and Friesen, 1975; Noller, 1980), or their feelings (e.g.,

Marangoni et al., 1995). In all these areas of social-psychological research, accuracy refers to the perception of characteristics of individuals in isolation, and not characteristics of the social relationship linking two individuals in a dyad. The few social-psychological studies on accuracy in perceiving the relationship between interacting individuals adopt a nomothetic approach, where the question is not who is accurate (variability of accuracy), but when and how people are accurate (level of accuracy) (Costanzo and Archer, 1989; Bernieri et al., 1996).

Social network research on interpersonal perception accuracy has traditionally focused on accuracy in self-perception. In an important series of studies, Killworth and Bernard (1976) and Bernard et al. (1980, 1982) have investigated people's accuracy in reporting their own communications and social interactions. Other work has focused on accuracy in an individual's perception of specific social events (Freeman and Romney, 1987; Freeman et al., 1987). Only a few network studies have focused on people's accuracy in perceiving the stable patterns of informal social interaction among others in a group (Krackhardt, 1987; Freeman et al., 1988; Krackhardt, 1990). These studies, however, have not identified the determinants of variability in individual accuracy. No relationship has been shown between an individual's centrality in an informal social network and his or her ability to perceive accurately how that network is structured (Krackhardt, 1987, 1990). Furthermore, Krackhardt (1990) did not find support for his prediction that people higher up in the formal hierarchy of an organization will have a more accurate picture of the informal networks that develop in the organization.

This study aimed at identifying the determinants of the variability in people's accuracy in perceiving the network structure of their social group. Two classes of potential determinants of accuracy in network perception were investigated: an individual's position in the social structure of the organization, and his or her personality traits. The social structure of an organization is defined as a stable pattern of orderly social relationships (Scott, 1987). As the social structure represents the stable characteristics of social interaction in an organization, personality traits can be considered relatively stable characteristics of an individual. Considering only stable independent variables was appropriate given that the object of network perception are social relationships, i.e., patterns of social interaction that develop over time. Freeman et al. (1987) provided indirect support for such a long-term conceptualization of social network perception. Although they did not investigate the perception of personal relationships in a given social context, they showed that people's perception of attendance at a specific social event was based on a long-term image of the social ties connecting the people in the network, and did not reflect the short-term variations occurring in these connections.

Social structural variables were operationalized as an actor's position in an organization's formal hierarchy and his or her work status (part-time vs. full-time), as well as an actor's centrality in the organization's informal social networks. By introducing the formal and informal social structure as a characteristic of the situation in which the observer is embedded, this paper explicitly conceptualized and measured the impact of situational and interactional factors on accuracy variability. Personality traits were operationalized in terms of motivational traits (need for achievement, and need for affiliation), extraversion, and self-monitoring. The criterion for accuracy relied on the subjective reports of the two people involved in each dyad in a group. Accuracy in

social network perception was defined as the agreement between an individual's perception of the social relationship linking each pair of people in the group and the consensus between the people in each dyad on the social relationship linking them. Both the informal network of friendship and work-related advice relations were taken into consideration. Hypotheses were tested based on network data collected at an Italian university.

## 2. Hypotheses: social structure

The important implication of the generic concept of social structure is that groups, organizations, and communities are differentiated entities. Due to this differentiation, only certain people interact with one another in certain ways and in certain situations. It is a basic premise of all sociological thinking that the opportunities for and circumstances of social interaction are not random, but instead they are distributed according to the patterns defined by the social structure.

Also, the process of social cognition has been argued to depend on the context of social relationships in which it occurs. In a review of the social-network literature on social cognition, Pattison (1994) distinguished between three ways in which the social context can influence social cognition. First, a person's position in the social structure may be related to cognition because it contributes to determining what information a person is exposed to. For example, Romney and Faust (1982) have found support for the notion that similar social positions lead to similar social perceptions. Second, based on a person's interaction history in a social context, an individual develops particular expectations about future interactions, and thus displays certain cognitive biases. Third, according to consistency theories (e.g., Heider, 1958), people's social positions may be related to their perceptions of the cognitions of those around them. These perceptions of other's cognitions may shape the individual's perceptions of themselves. These three arguments are incorporated in the constructivist theory of Carley (1990, 1991) and Kaufer and Carley (1993). Carley theorizes that social interaction and knowledge dynamically co-evolve: social interaction drives knowledge acquisition, which drives social interaction; shared social position leads to shared knowledge, which leads to shared social position; and level of social interaction among individuals in a social entity determines the extent of their shared knowledge, and vice-versa. It follows from constructivist theory that differences in people's perception, and thus variability in accuracy, are a function of both cognitive processing and knowledge, and position in the social structure.

In this study, the influence of the social context on social cognition, according to various combinations of the three processes described above, is analyzed with reference to a person's position in the formal organizational structure (hierarchical level, and work status), and his or her position in the informal network structure (centrality).

### 2.1. Formal structure: hierarchical level

Occupying a high-level position in an organization may give an intrinsic advantage in terms of information flows for work-related matters. As noted by Krackhardt (1990),

supervisors and managers, by virtue of their positions, pay attention to how their subordinates work together, and are entitled to ask their subordinates for such information. It can be hypothesized, then, that hierarchical level will be positively correlated to accuracy in the perception of the advice network.

**Hypothesis 1:** *An individual's hierarchical level in an organization is positively related to his or her accuracy in the perception of the advice network.*

Because of the formal role associated with their position, higher-level participants tend to be isolated from the informal friendship network that develops at lower levels of the organization. The possibility of developing a personal friendship with your supervisor is hampered by the formal role the supervisor plays in determining rewards, promotions, or your very survival in the organization. Moreover, higher-level participants may not be interested in establishing friendly relationships with subordinates. Zenger and Lawrence (1989) showed, for instance, that people in an organization prefer to spend time with people with equal or longer tenure as them. Because of their isolation from the friendship network existing at lower levels of the organization, in perceiving the informal network of friendship high-level organizational participants may be less accurate than lower-level participants.

**Hypothesis 2:** *An individual's hierarchical level in an organization is negatively related to his or her accuracy in the perception of the friendship network.*

Krackhardt (1990) attributed the absence of a relationship between formal position and accuracy to the small size of the organization selected for his study. It might instead have resulted from the relative flatness of that organization (which only had three hierarchical levels in its formal chart), and therefore the lack of variability in the information received by people occupying different hierarchical levels. It is possible that, in the context of a more stratified organization, hierarchical level might prove to be a more powerful predictor of accuracy.

## 2.2. Formal structure: work status

The constructivist view of knowledge acquisition of Carley (1990, 1991) and Kaufer and Carley (1993) suggests that the different patterns of interaction that accompany different work status are likely to change an employee's knowledge and interpretation of organizational events. Social interaction promotes knowledge acquisition, and shared social position leads to shared knowledge. As individuals spend time in an organization, they acquire information about the formal and informal structure of the organization, and they share organizational knowledge with those who are in similar organizational positions. For instance, part-time status changes an employee's opportunities for interaction simply by reducing the time an employee spends inside the organization. Part-timers may have schedule flexibility but be socially isolated (Becker, 1986).

**Hypothesis 3a:** *An individual's part-time work status in an organization is negatively related to his or her accuracy in the perception of the advice network.*

**Hypothesis 3b:** *An individual's part-time work status in an organization is negatively related to his or her accuracy in the perception of the friendship network.*

### 2.3. Informal structure: centrality

Degree centrality is the most intuitive network conceptualization of centrality, and it has a simple theoretical relationship with accuracy. The degree of a person is simply the number of people that person is directly tied to. When centrality is conceptualized in terms of degree, what is tapped is the potential for communication activity of an individual (Freeman, 1979). Krackhardt (1987) did not find a relation between an actor's degree centrality in the work-related advice network and his or her accuracy in perceiving the structure of that network. It can be argued that having lots of people going to a person for work-related advice does not provide the advisor with additional knowledge about the informal structure of the advice network. The advisor provides technical information, but does not receive any social information on the advice network in return. A person who is considered a friend by many people, however, does receive precious information on the informal friendship network. This point was supported by Krackhardt (1992) in his study of a small entrepreneurial firm, where the most central person in the friendship network had a much more accurate perception of the friendship network than the most central person in the advice network, whose centrality gave him little advantage in understanding the structure of the advice network.

**Hypothesis 4:** *An individual's degree centrality in the group's friendship network is positively related to his or her accuracy in the perception of the friendship network.*

### 3. Hypotheses: personality

In the social networks literature, a few recent studies have started to address the question of whether individual differences predict people's position in their social network (Burt et al., 1998; Conn, 1997), but this work typically does not address the accuracy question. As for the psychological literature, with the decline in researchers' interest in the role of individual differences in interpersonal accuracy, personality traits have survived as a determinant of interpersonal accuracy only in relation to meta-accuracy, i.e., people's accuracy in perceiving what others think of them. In this research, personality traits are mostly seen as motivational forces. People high in need for approval, for instance, are seen as evaluatively dependent, and highly motivated to be viewed favorably by others (Crowne and Marlowe, 1960). Similarly, socially anxious people deeply care about the impression of themselves they convey to others, and think that others take an especially dim view of them (Poza et al., 1991).

The present study proposes to extend the role of motivational traits beyond meta-accuracy, and investigates the role of extraversion as an additional potential determinant of accuracy in network perception.

### *3.1. Motivation: need for achievement, and need for affiliation*

The importance attributed to motivation in the theory of social cognition has changed over time (Fiske and Taylor, 1991). Recently, a growing emphasis on motivated social cognition (Showers and Cantor, 1985) has conceptualized the social perceiver as a thinker who chooses among multiple cognitive strategies based on his or her needs, and motives. Sometimes, the social perceiver chooses in the interest of accuracy, while other times he or she chooses in a self-serving, inaccurate fashion, in the interest of self-esteem or the reduction of cognitive effort. The current study adopted this view of the motivated social perceiver. The objective was to identify stable characteristics of a person's motivation and test the effect of these characteristics on accuracy. To that end, the need theory of Murray (1938) was chosen as the motivation theory of reference. The need theory of Murray (1938), as developed by McClelland et al. (1953), posits that motivated behavior is to a great extent a function of the strength of an individual's various need. Such needs are relatively stable characteristics of an individuals, stemming from one's genetic inheritance, as well as personal history and upbringing (e.g., Cattell, 1982; Eaves et al., 1989), and should be considered aspects of a complex personality structure (McClelland et al., 1953).

This study focused on need for achievement, and need for affiliation, two frequently studied motivational traits (Steers and Spencer, 1977; Matsui et al., 1982; Harvey and France, 1987). Need for achievement is defined as the need to strive for success or accomplish difficult tasks. Need for affiliation is defined as the need to secure and maintain friendly associations. To the extent that the attention a person pays to his or her social environment is a function of motivational forces, it can be hypothesized that accuracy in network perception is related to manifest needs.

In the theory of manifest needs, need for achievement is defined in terms of evaluated performance (McClelland et al., 1953). The need to be successful in carrying out a task relates a person's need for achievement directly to the evaluation of his or her performance. Cognitively, the focus of attention of an individual with a strong need for achievement is likely to be on the source of evaluation of his or her performance, and on the means to accomplish one's goals. To the extent that the criteria for the evaluation of one's work performance are set at the organizational level, to the individual with a strong need for achievement it is important to perceive accurately the informal network of work-related advice, since this network provides actors in the organization with the information they need to evaluate performance. Moreover, to the extent that performance depends on the ability of getting the right advice from the right people, people will be concerned with others' advice relations, since those relations are an important signal of who the 'right' people are. Finally, given that an accurate perception of the advice network is related to individual power (Krackhardt, 1990), to the extent that power is related to success high achievers will be likely to attentively observe the advice network. Such motivated monitoring of advice relationships in a given social context

should increase one's accuracy in the perception of the informal advice network. Furthermore, to the extent that success is defined in social terms (e.g., being popular), need for achievement can be hypothesized to be related also to accuracy in the friendship network. In order to evaluate one's popularity in the friendship network, an individual needs to perceive accurately and monitor the popularity of others, possibly in order to establish social relationships with the popular members of the network and thus boost his or her popularity.

**Hypothesis 5a:** *In perceiving the advice network, individuals with a strong need for achievement are more accurate than individuals with a weak need for achievement.*

**Hypothesis 5b:** *In perceiving the friendship network, individuals with a strong need for achievement are more accurate than individuals with a weak need for achievement.*

A strong need for affiliation is likely to increase a person's attention to the informal friendship network. The need to secure and maintain friendly associations should lead a person to devote a large part of his or her cognitive energy to the monitoring of the friendship network.

**Hypothesis 6:** *In perceiving the friendship network, individuals with a high need for affiliation are more accurate than individuals with a low need for affiliation.*

### 3.2. Motivation: self-monitoring

Self-monitoring is defined as an individual's tendency towards self-observation and self-control guided by situational cues to social appropriateness (Snyder, 1974, 1987). Due to their concern for social appropriateness, and the desire to change their public appearance depending on different social situations and interpersonal relationships, high self-monitoring individuals are particularly sensitive to the behavior and self-presentation of others in a social situations, and monitor their self-presentation based on these cues. Unlike high self-monitoring individuals, low self-monitors are not so concerned with constantly assessing the social climate around them (Snyder, 1987: 5).

The attentiveness to social information of high self-monitors may lead to accuracy in the perception of the social context. Even though the self-monitoring individual attentively observes the social situation out of a desire for conformity to social norms, and not out of a desire for social perceptiveness, accuracy is likely to follow as a by-product of the attentive monitoring of the social environment.

**Hypothesis 7a:** *An individual's self-monitoring is positively related to his or her accuracy in perceiving the friendship network.*

**Hypothesis 7b:** *An individual's self-monitoring is positively related to his or her accuracy in perceiving the advice network.*

### 3.3. Extraversion

The concept of extraversion was first introduced by Eysenck (1947) to describe psychological personality types. Extraversion typifies people whose interests and attention are directed towards others, who feel easy in social situations, and who feel free to carry out appropriate actions in the open. Introverts, on the contrary, direct their attention inward toward themselves, tend to withdraw from social situations, and tend to be self-reliant. Since its first conceptualization, extraversion has been recognized as a fundamental personality trait (Eysenck and Eysenck, 1968).

The very few studies which have linked extraversion to cognition do not provide us with specific evidence regarding the existence and the direction of a relationship between extraversion and accuracy in network perception (Kato, 1987; Graziano et al., 1985). However, it is intuitively compelling to predict that people who are comfortable in social situations and attentive to the outside world are more likely to see this world more accurately than people who avoid social situations and direct their attention mostly towards themselves.

**Hypothesis 8a:** *An individual's extraversion is positively related to his or her accuracy in the perception of the friendship network.*

**Hypothesis 8b:** *An individual's extraversion is positively related to his or her accuracy in the perception of the advice network.*

## 4. Method

### 4.1. The site

The organization selected for the study is constituted by three research centers belonging to an Italian University. Although formally distinct, and pursuing different research interests, the three centers constitute a single sub-unit of the university's research apparatus. First, all three centers are directed by the same person. Second, at times the centers conduct joint research. Third, the three centers occupy the same hallway of the same floor of the same building of the university. In this location, researchers share offices, regardless of their formal membership in one center or the other. Thus, to some extent all members of the organization interact with one another. The centers, which were founded between 1987 and 1989, count 25 people as formal members in different hierarchical positions. They are funded by the profits from each center's research and teaching activities, as well as by the university. Since their founding, all centers have been profitable.

### 4.2. Hierarchical level and work status

Though small, the organization has a rather vertical formal structure, constituted by five distinct hierarchical levels. At the top level, there is the director of the three centers, who makes all major decisions in the organization. At the next level, there are three

vice-directors, who are responsible for the scientific development of research and teaching projects. The next level consists of two administrative coordinators, who have no involvement in the scientific aspects of the centers' activities, but are responsible for the organizational and logistics aspects of the life of the centers. Among their roles, the coordinators collect, screen, and summarize information flowing from the lower levels to the director. They constitute the operational link between the top and the lower levels, which, for most non-scientific matters, do not communicate directly. The following level consists of seventeen researchers, who constitute the largest group in the organization. Researchers occupy the lowest level of the academic hierarchy. At the lowest level of the group hierarchy there are two secretaries. Of the 25 members of the research centers, 4 have part-time work status.

Hierarchical level was scored in the following way: a score of 5 was given to the director; the three vice-directors were scored 4; the coordinators were given a score of 3; a score of 2 was given to the researchers; secretaries were given a score of 1. As for the operationalization and measurement of work status, a dummy variable was introduced to distinguish part-time employees (code = 1) from full-time employees (code = 0).

#### *4.3. Centrality*

As argued by Carley and Krackhardt (1996), asymmetric ties in social networks should be considered as structural characteristics of social interaction, not as errors to be corrected. In the present study, since asymmetric ties were frequent in both the advice and the friendship network, indegree was used as a measure of degree centrality. An actor's indegree centrality is defined as the number of ties converging on that actor. For instance, in the advice network, a person's indegree score is the number of people who go to that person for advice.

#### *4.4. Need for achievement and need for affiliation*

The Need for Achievement and Need for Affiliation scales of the Manifest Needs Questionnaire developed by Steers and Braunstein (1976) were used to measure need for achievement, and need for affiliation. Each scale contains five items, such as "I try very hard to improve on my past performance" (Need for Achievement), and "When I have a choice, I try to work in a group instead of by myself" (Need for Affiliation). Each item is scored on a 1 to 7 Likert scale, with total scale scores ranging from 5 to 35. Several studies have shown that, although the scales possess adequate stability, their internal consistency must be interpreted in light of the psychometric properties of the specific sample studied (Blackburn, 1981; Dreher and Mai-Dalton, 1983; Mudrack, 1993). The internal consistency reliability coefficients (Cronbach  $\alpha$ ) for the present sample were 0.58 for need for achievement, 0.60 for need for affiliation, which can be considered acceptable given the small number of items in the scale (Steers and Braunstein, 1976).

#### *4.5. Extraversion and self-monitoring*

Extraversion was measured with the Extraversion scale of Straus (1996), an eight-item scale which was validated against the Extraversion scale of the Eysenck Personality

Inventory (Eysenck and Eysenck, 1968). The reliability coefficient for the extraversion scale was 0.68.

The 18-item self-monitoring scale developed by Snyder and Gangestad (1986) was used to measure self-monitoring (Cronbach  $\alpha = 0.62$ ). Psychometricians have pointed out flaws in the factor structure of both the original 25-item self-monitoring scale (Snyder, 1974), and the revised 18-item scale (Snyder and Gangestad, 1986). According to these studies, the scale contains not just one, but at least two relatively orthogonal factors (e.g., Nowack and Kammer, 1987; Briggs and Cheek, 1988). John et al. (1996) have suggested that, while one of these factors shows no discriminant validity against measures of extraversion, the other correlates neither with extraversion nor with other measures of self-monitoring. Since the evidence available does not seem to allow an unambiguous resolution of the debate about the self-monitoring scale, the factor analytic structure of the scale must be evaluated vis-a-vis the specific sample studied. An exploratory factor analysis of the self-monitoring data collected in this study was performed, providing evidence for the existence of more than one factor ( $X,235 = 189, p = 0.001$ ).

#### 4.6. Accuracy

In network analysis, the structure of a social system is defined as a set of relational statements between all pairs of actors in the system. The measurement of this system can be based on long-range observational data (which are in many cases virtually impossible to gather) or on self-report data. Cognitive social structures are a type of self-report data that is particularly powerful in the study of accuracy in social network perception (Krackhardt, 1987). The cognitive social structure of a social system is conceptualized as a three-dimensional array of linkages,  $R_{ijk}$ , among a set of  $N$  actors, where  $i$  is the sender of the relation,  $j$  is the receiver of the relation, and  $k$  is the perceiver of the relation between  $i$  and  $j$  (Krackhardt, 1987).

Organizational participants' cognition of their network is formally defined for person  $k$  as:

$$R_{kj} = \begin{cases} 1 & \text{if } R_{ijk} = 1 \\ 0 & \text{if } R_{ijk} = 0. \end{cases}$$

The individual cognition of two relations, friendship and work-related advice, was measured through a questionnaire in matrix format (see Appendix A). In the friendship network, each person  $k$  in the organization was asked whether he or she thought that person  $i$  considered person  $j$  as a personal friend. In the case of a positive answer, person  $k$  would place a check in the cell of the friendship network matrix that corresponded to a relation going from  $i$  to  $j$ . The same procedure was used to assess the advice cognitive social structure. In this case, person  $k$  was asked whether he or she thought that person  $i$  would go to person  $j$  for work-related advice.

The resulting binary individual network cognitions were aggregated in order to obtain the 'actual' structure of the network (as opposed to the individual cognition of the social network). In this study, the actual network was defined as a locally aggregated structure

(Krackhardt, 1987), where a relationship between  $i$  and  $j$  exists if  $i$  and  $j$  agree it exists. The concept of locally aggregated structure (Krackhardt, 1987) is only one possible approach to the definition of the 'actual' structure of a network emerging from the aggregation of individual network representations. Consensus structures based on threshold functions (Krackhardt, 1987, 17-118; Kumbasar et al., 1994), central graphs (Banks and Carley, 1994), and informant consensus analyses (Romney et al., 1986; Batchelder et al., 1997) also address the issue of aggregating individual network perceptions, and thus provide different views of the 'actual' network. The consensus question that these studies address is closely related to the accuracy question. However, as noted by Kenny (1994), consensus does not necessarily imply accuracy. Given our interest in accuracy, in this study we opted for the adoption of locally aggregated structures, aware of the fact that more theoretical and empirical work is needed to define the domain in which these approaches are more appropriate. Formally, the actual friendship and advice network was defined as follows:

$$R_{ij} = \begin{cases} 1 & \text{if } R_i \text{ and } R_j = 1; \\ 0 & \text{otherwise.} \end{cases}$$

In measuring accuracy, it is essential to control for the fact that people call equally intense relationships with different names. Some people label as friendships only intimate relationships, while others see friendship even in superficial relationships. Cronbach (1955) called attention to this problem in the social-psychological research on judgmental accuracy. In judging others, two people may use the rating scale in different ways, with one consistently using the scale's higher region, and the other consistently using the scale's lower region. The manner in which one uses the rating scale has nothing to do with one's insight, and should not be included in the measurement of accuracy. Global accuracy for individual  $k$  was measured as the Phi correlation score between  $k$ 's matrix representation of his or her network, and the actual matrix structure of that network. This measure of correspondence was chosen since it manages to control for different uses of the rating scale while at the same time having desirable metric and Euclidean properties (Gower and Legendre, 1986). Formally, for each individual  $k$ , global accuracy was calculated as the MRQAP correlation (Krackhardt, 1988) between matrices (3) and (4).

$$R_{ij}^k \quad (3)$$

$$R'_{ij} \quad (4)$$

#### 4.7. Procedure

A questionnaire containing the personality scales and the matrices for the collection of data on the friendship and advice networks was distributed to all 25 members of the research centers. The respondents were asked to fill out the questionnaire at their leisure during work hours and return the questionnaire to the researcher within the following week. Participants were guaranteed confidentiality of their answers. Of the 25 people asked to participate in the study, 24 completed the questionnaire.

## 5. Results

Table 1 shows the correlation structure for all dependent and independent variables. Descriptive statistics for the dependent variables and the predictors are presented in Table 2. Given the presence of strong to weak associations among independent variables (e.g., between hierarchical level and centrality in the advice network, between part-time and hierarchical level, and between extraversion and centrality in the friendship network) regressions were performed on each dependent variable in order to eliminate sources of spuriousness (Table 3). Regression coefficients were standardized in order to facilitate the interpretation of the magnitude of associations.

### 5.1. Social structure

Contrary to Hypothesis 1, the results show a strong unpredicted negative relationship between hierarchical level and accuracy in the perception of the advice network ( $b = -0.532$ ;  $p = 0.014$ ). In the friendship network, hierarchical level has a negative association with accuracy ( $b = -0.397$ ;  $p = 0.025$ ), thus supporting Hypothesis 2. Part-time status has the predicted negative association with accuracy in the advice network ( $b = -0.403$ ;  $p = 0.020$ ), consistently with Hypothesis 3a. In the friendship network, however, the weakness of the association between part-time status and accuracy ( $b = -0.051$ ), and the large size of the coefficient's standard error (0.151), do not provide support for Hypothesis 3b. Consistently with Hypothesis 4, degree centrality has a positive relationship with accuracy in the friendship network ( $b = 0.412$ ;  $p = 0.021$ ), but also an unpredicted positive association with accuracy in the advice network ( $b = 0.348$ ;  $p = 0.078$ ). Overall, structural variables explain about 40% of the variance in accuracy in both the advice network (adjusted  $R^2 = 0.405$ ,  $F_{3,20} = 6.22$ ) and the friendship network (adjusted  $R^2 = 0.405$ ,  $F_{4,9} = 6.21$ ).

### 5.2. Personality

Need for achievement displays a moderate positive association with accuracy in the perception of both the advice network ( $b = 0.285$ ,  $p = 0.056$ ) and the friendship

Table 1  
Correlations among variables (N = 24)

	1	2	3	4	5	6	7	8	9
(1) Advice accuracy									
(2) Friendship accuracy	0.599								
(3) Hierarchical level	-0.416*	-0.485*							
(4) Part-time	-0.644***	-0.350	0.356						
(5) Need for achievement	0.3851	0.250	0.113	-0.128					
(6) Need for affiliation	-0.072	0.430*	-0.092	-0.133	-0.126				
(7) Extraversion	0.165	0.251	0.163	-0.015	0.057	0.235			
(8) Self-monitoring	-0.264	0.096	0.124	0.039	-0.036	0.242	-0.059		
(9) Advice indegree	0.076	-0.033	0.540**	-0.105	0.167	0.250	0.094	0.214	
(10) Friendship indegree	0.445*	0.563**	-0.199	-0.163	0.038	0.080	0.393'	0.111	0.286

$p < 0.1$ ; \*  $p < 0.05$ , \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

Table 2  
Means and standard deviations of variables

	Mean	S.D.
<i>Dependent variables</i>		
(1) Advice accuracy	0.450	0.120
(2) Friendship accuracy	0.420	0.118
<i>Independent variables</i>		
(3) Hierarchical Level	2.291	0.907
(4) Part-time	0.166	0.380
(5) Extraversion	39.666	5.104
(6) Need for achievement	27.375	3.118
(7) Need for affiliation	20.833	4.584
(8) Self-monitoring	6.5	2.904
(9) Advice degree centrality	9.964	15.031
(10) Friendship degree centrality	15.942	11.151

network ( $b^{\wedge} = 0.318$ ,  $p = 0.056$ ), thus supporting Hypotheses 5a and 5b. Consistently with Hypothesis 6, need for affiliation has the predicted positive relationship with

Table 3  
Standardized regression coefficients ( $N = 24$ )

Independent variables	Friendship accuracy	Advice accuracy
Hierarchical level	<b>-0.397</b> <i>0.161</i> (0.025)	<b>-0.532</b> <i>0.193</i> (0.014)
Part-time	<b>-0.051</b> <i>0.151</i> (0.742)	<b>-0.403</b> <i>0.155</i> (0.020)
Degree centrality	<b>0.412</b> <i>0.161</i> (0.021)	<b>0.348</b> <i>0.185</i> (0.078)
Need for achievement	<b>0.318</b> <i>0.142</i> (0.040)	<b>0.285</b> <i>0.138</i> (0.056)
Need for affiliation	<b>0.376</b> <i>0.152</i> (0.025)	<b>-0.241</b> <i>0.155</i> (0.140)
Extraversion	<b>0.048</b> <i>0.165</i> (0.776)	<b>0.243</b> <i>0.142</i> (0.106)
Self-monitoring	<b>0.024</b> <i>0.149</i> (0.872)	<b>-0.174</b> <i>0.140</i> (0.233)
Adjusted R <sub>z</sub>	0.597	0.566
$F_{7, 6}$	5.871	5.283
p-Value	0.001	0.003

Coefficients are in bold. Standard error are in italics. Two-tailed p-values are in brackets.

accuracy in perceiving the friendship network ( $b^{\wedge} = 0.367$ ,  $p = 0.025$ ). It also has an unpredicted moderate negative association with accuracy in perceiving the advice network ( $b^{\wedge} = -0.241$ ,  $p = 0.140$ ). The standard error associated with this coefficient, however, is relatively large, thus undermining the stability of the coefficient. The same can be said of the positive association between extraversion and advice accuracy ( $b^{\wedge} = 0.243$ ,  $p = 0.106$ ), which provides only weak support for Hypothesis 8b. Hypothesis 8a is not supported ( $b^{\wedge} = -0.048$ ,  $p = 0.776$ ). The relationship between self-monitoring and accuracy is also not supported in either the friendship network ( $b^{\wedge} = -0.024$ ,  $p = 0.872$ ) or the advice network, where a relatively large standard error (0.140) add instability to an already weak association ( $b^{\wedge} = -0.174$ ,  $p = 0.233$ ). Overall, personality variables explain 6.5% of the variance in advice accuracy (adjusted  $RZ = 0.065$ ,  $F_{3,20} = 1.40$ ), and about 15% of the variance in friendship accuracy (adjusted  $RZ = 0.146$ ,  $F_{4,17} = 1.98$ ).

## 6. Discussion

These results confirm the proposition underlying this study, that both personality and social-structural factors be taken into consideration when attempting to explain accuracy in network perception. The general regression models used in the study explain almost 60% of the variability in accuracy in the perception of both the advice network and the friendship network. Structural variables contribute a larger portion of the explained variance. It should be noticed, however, that the low internal consistency of all personality scales in this study is likely to have played a crucial role in weakening the associations between personality variables and accuracy.

As for the impact of the formal structure on accuracy, occupying high hierarchical positions negatively affects a person's ability to see the friendship network accurately, as predicted. Surprisingly, hierarchical level also has a negative effect on accuracy in the advice network. Since accuracy in the perception of the advice network is a source of power, such a finding can be interpreted as evidence that higher-level employees may not desire, or need, to gain power through an accurate perception of the organization's informal structure. Higher-level employees are more powerful than other members of the organization by virtue of their formal position (Krackhardt, 1990). Therefore, even when an accurate knowledge of the informal power structure would improve managerial performance, high-rank participants may not perceive the need to invest their cognitive energies in the monitoring of the informal structure of their organization. The peculiar formal structure of the organization investigated in this study also suggests that higher-level organizational members may exercise their power in one network, while building that power in another network. The research centers analyzed in this study are embedded in a larger university. It is at the university level that the centers' director and vice-directors' power is built, and not in the research centers per se. For higher-level employees, the research centers mostly represent the location where power is used, and not the source of that power. In general, whenever multiple, overlapping networks are at play, being inaccurate in perceiving the social structure of one network might simply

reflect an efficient way to invest one's cognitive energies only on the networks that are relevant for the acquisition of power.

As for the effect of work status on accuracy, the results suggest that it does take constant attention to small details of social interaction in an organization to learn how one's social environment is structured. In the organization investigated in this study, part-timers were worse than full-timers in perceiving the advice network. Part-timers did not fare poorly in the perception of the friendship network, however, despite their sporadic presence in the organization. In the organization considered in this study, some ethnographic evidence helps us explain such a result. Two out of the four part-timers have strong friendship ties with several other members of the organization with whom they spend time outside the work-place. This would suggest that, while knowledge about friendship ties can be collected through friendly interactions that do not strictly depend on a day-to-day interaction on the job, work-related advice interactions can be perceived accurately only through direct observation of the work-place.

An individual's level of social involvement, as measured by degree centrality, is an important correlate of accuracy across types of social relationships (advice vs. friendship). This result indicates that even typically asymmetric relationships, such as advice, can be productive channels of social information for both parties involved.

As for personality, also motivational traits play a significant role in predicting accuracy across types of social relationships. Need for achievement has the predicted positive effect on both accuracy in the friendship network and in the advice network. As for need for affiliation, the desire to secure and maintain friendly associations with one's social environment improves the perception of the friendship network at the expense of accuracy in perceiving the advice network. This suggests the existence of two aspects to one's social attentiveness: on the one hand, the desire to be in tune with the personal, warm and fuzzy side of one's social environment; on the other hand, the desire to be in tune with the professional, work-related side of one's social environment. A trade-off seems to exist between these two sides of social attentiveness, with individuals who are 'people-oriented' simply not paying much attention to their professional environment. Whether this effect is due to lack of motivation or to cognitive limitations is a question that the present study cannot address.

Self-monitoring plays no role in determining accuracy, despite the intuitively compelling relation between a person's attentiveness to social cues and his or her accuracy in perceiving the structure of the social environment. The reason for the lack of a relation between accuracy and self-monitoring might be more methodological than conceptual, however, given the flaws in the factor structure of the scale. The positive relationship between extraversion and accuracy was weakly supported only in the friendship network, which may be indicative of a discrepancy between the personal and professional aspects of feeling at ease in social situations parallel to the distinction between personal and professional sides of social attentiveness described above with reference to affiliation needs. According to this interpretation, the sociability of extraverts is related to accuracy in the perception of intrinsically 'social' relationships, such as friendship, but not intrinsically 'instrumental' relationships, such as work-related advice. Lacking stronger associations, however, such an interpretation amounts to little more than speculation.

### 6.1. Limitations and future research

Caution should be used in interpreting and using these results. The small size of the organization utilized for the data collection limits the statistical power of this study. The high predictor-to-case ratio produces a situation where few extreme observations can unduly impact the direction and magnitude of associations. As for external validity, this study suffers from all the limitations of case-studies (Yin, 1994). Replications of these results in different social contexts would therefore be desirable.

Despite these limitations, this study adds to the research on judgmental accuracy in interpersonal perception. It complements psychological work on contextual determinants of accuracy by introducing social network analysis for the conceptualization and measurement of the social situation, and for the definition of a criterion for judgmental accuracy. More importantly, this study successfully brings individual differences back in the study of interpersonal accuracy, thus encouraging the investigation of accuracy in social perception and cognition through the consideration of both the person and the situation.

Future research on the determinants of accuracy in social network perception would benefit from investigating a broader range of individual differences in relation to different subsets of a social system. Bondonio (in press) showed that accuracy varies with the perceiver's proximity to the people involved in an interaction, and suggested that accuracy in network perception may be better understood in terms of one's ability to perceive accurately different network subsets, than in terms of an individual's ability to perceive the entire, undifferentiated structure of the network. Casciaro et al. (1998) have shown the potential of this line of research with a study of depression and positive affect as determinants of accuracy in social network perception. Their results showed that affective variables have opposite effects on an individual's local accuracy in perceiving the patterns of interaction of the people with whom he or she is directly connected to, and his or her accuracy in perceiving the global patterns of interaction in the network as a whole. More research is needed to further specify the scope of the relationship between individual differences and accuracy.

Future work should also address the role of the person and the situation as joint determinants of accuracy. While the present study has provided evidence that both contextual factors and individual differences have main effects on accuracy in interpersonal perception, limits in statistical power did not permit an investigation of the interaction between context and individual differences. It is in this moderating effects, however, that interesting action may be found.

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**Appendix A. Friendship matrix**

By putting an 'X' in the cells of the following matrix, please indicate whether you think the people listed in each row (from I to 25) considers the people listed in each column (from A to Z) as personal friends. For example, if you think that Ms. Lang (row 9) considers Mr. Norris (column N) as a friend, place an 'X' in the corresponding cell '9N'.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1 Adams																										
2 Anderson																										
3 Bennett																										
4 Frick																										
5 Grant																										
6 Green																										
7 Guidelli																										
8 Gunde																										
9 Jacket																										
10 Lang																										
11 Marcus																										
12 Newman																										
13 Norris																										
14 Oliver																										
15 Olson																										
16 Perlman																										
17 Perry																										
18 Poole																										
19 Price																										
20 Rummel																										
21 Sanders																										

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